

PRELIMINARY
STORMWATER CONTROL PLAN
for
WILDFLOWER STATION – SUBDIVISION 9601

FEBRUARY 2024

Meadow Creek Group, Inc.
1500 Willow Pass Court
Concord, CA 94520

prepared by:

Carlson, Barbee, & Gibson, Inc.
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Exhibits/Attachments

- Exhibit 1 – Vicinity Map
- Exhibit 2 – Existing Conditions
- Exhibit 3 – Proposed Conditions
- Attachment 1 – IMP Sizing Calculation (Treatment & Flow)
- Attachment 2 – Stormwater Management Plan
- Attachment 3 – Stormwater Management Plan Details

This Stormwater Control Plan was prepared using the template dated February 2023.

I. PROJECT DATA

Table 1. Project Data

Project Name/Number	Wildflower Station
Application Submittal Date	February 2024
Project Location	Hillcrest Avenue at Wildflower Drive APN: 052-140-013, 052-140-014, 052-140-015, 052-140-016
Name of Developer	Meadow Creek Group, Inc.
Project Phase No.	Townhomes
Project Type and Description	Townhome style residential with 19 buildings to contain 159 Condominium units.
Project Watershed	San Joaquin River
Total Project Site Area (acres)	10.35 Acres
Total Area of Land Disturbed (acres)	8.07 Acres
Total New Impervious Surface Area (acres)	5.43 Acres
Total Replaced Impervious Surface Area	0.72 Acres
Total Pre-Project Impervious Surface Area	2.90 Acres
Total Post-Project Impervious Surface Area	7.80 Acres
50% Rule	Applies
Project Density	20.05 DU/AC (multi-family)
Applicable Special Project Categories	Not Applicable
Percent LID and non-LID treatment	100% LID
HM Compliance	Applies

II. SETTING

II.A. Project Location and Description

The Wildflower Station Project is located at the intersection of Hillcrest Avenue and Wildflower Drive in the City of Antioch, Contra Costa County, CA. The project site is bordered to the north by Hillcrest Crossroads and to the east by existing residences with Wildflower Drive to the south and Hillcrest Avenue to the west. This project is the completion of the vacant parcel within the Wildflower Station Project (Subdivision 9427). See Exhibit 1 for the project vicinity map.

In this portion of the project, the site proposes to construct 19 buildings consisting of 159 townhome style condominium units. This portion of the project will develop 8.07 acres and consists of 75% impervious surfaces and 25% pervious surfaces.

II.B. Existing Site Features and Conditions

The current project site is a vacant, previously graded parcel within a portion of Wildflower Station project located between Hillcrest Avenue and Wildflower Station Place. The Wildflower Station Place roadway, concrete walks, and landscaped areas are already constructed. Portions of Wildflower Station Place and adjacent buildings will be managed by proposed stormwater facilities within the project. The remainder of Wildflower Station Place and a portion of Hillcrest Crossroads are managed by existing stormwater facilities that will remain. The existing site is roughly 75% pervious. See Exhibit 2 for existing site conditions.

There are existing drainage pipelines that bisect through the site and connect to the existing storm drain system on Hillcrest Avenue.

The Wildflower Station project site is part of the moderate climate of the San Francisco Bay Area Region. Annual temperature patterns are typical of coastal areas. The mean annual precipitation on site is 13.6 inches, based on The Mean Seasonal Isohyets Map by Contra Costa County Flood Control and Water Conservation District. Precipitation is evenly distributed throughout the fall, winter and spring, but is very low in the summer. Moisture occurring in the summer is generally from the coastal fog.

The site is relatively flat with the land sloping approximately 2.0% from east to west. The project site is classified as both Hydrologic Soil Group C and Group D. It is underlain by surficial soils overlying siltstone bedrock. The upper 10 feet of the clay is generally very stiff. Groundwater was not encountered during the geotechnical field investigation. Fluctuations in ground water levels occur due to many factors including seasonal fluctuation, underground drainage patterns, regional fluctuations, and other factors.

II.C. Opportunities and Constraints for Stormwater Control

Stormwater constraints include:

- Low Soil Permeability: The soil on the project site is designated as hydrologic soils groups C and D, indicating low to no infiltration.
- Rain Cycle: Opportunities for storage and reuse are hindered by the rain cycle of the Bay Area. The time periods between the rain season and the dry season are long enough to make storage of rain water for reuse infeasible.
- Steep Slopes: This site contains natural slopes. This introduces design challenges to provide bioretention areas with flat bottoms to achieve the necessary bio-filtration.

Stormwater opportunities include:

- *Landscaping:* The proposed project will utilize disconnected impervious areas and landscape features including multiple bioretention areas to treat and manage stormwater. Condominium building grading and drainage will ensure areas of landscaping are maximized to minimize runoff and impervious areas are directed to the treatment areas.

III. LOW IMPACT DEVELOPMENT DESIGN STRATEGIES

III.A. Optimization of Site Layout

III.A.1. Limitation of development envelope

The project will take advantage of a compact site design within the areas being developed. The site design will allow space for bioretention areas.

III.A.2. Preservation of natural drainage features

The existing drainage swale on site will be removed and replaced with a new storm drain system. The proposed design will reduce site runoff from the existing conditions by implementing micro-detention within each bioretention facility.

III.A.3. Setbacks from creeks, wetlands, and riparian habitats

There are no creeks, wetlands, or riparian habitats adjacent to the site.

III.A.4. Minimization of imperviousness

Private street widths have been reduced to the minimum dimensions allowed for fire and pedestrian safety. The apartment buildings have maximized the ratio of livable space to building footprint.

III.A.5. Use of drainage as a design element

The design of the project is influenced by the need for drainage. Bioretention areas are designed to integrate into the landscape design.

III.B. Use of Permeable Pavements

Due to the relatively low permeability of the underlying soils at the site, the use of permeable pavement is not feasible at the project site.

III.C. Dispersal of Runoff to Pervious Areas

The project site will be entirely piped, and runoff will drain towards bioretention facilities.

III.D. Bioretention or other Integrated Management Practices

The runoff from the landscaped areas, concrete walks, roofs, and roadway will be directed towards an on-site bioretention area either located on the northern area of the site or the southern area of the site. A low flow pump is required to direct the runoff into the northern bioretention area. Additionally, a portion of the previously constructed Wildflower Station Place roadway, sidewalks, and roof areas will be routed towards the northern bioretention area. The stormwater control design has been fully coordinated with the site plan, grading plan, and landscape plan.

IV. DOCUMENTATION OF DRAINAGE DESIGN

IV.A. Descriptions of each Drainage Management Area

IV.A.1. Table of Drainage Management Areas

Table 2. Drainage Management Areas

<i>DMA Name</i>	<i>Area (SF)</i>	<i>Surface Type/Description</i>	<i>DMA Type/Drains to</i>
DMA 1	370,172	Concrete or Asphalt, Roof, Landscape	Drains to IMP 1
DMA 2	27,974	Concrete or Asphalt, Roof, Landscape	Drains to IMP 2
DMA 3	32,222	Concrete or Asphalt, Landscape	Treated by Existing Facilities
DMA 4	10,538	Concrete or Asphalt, Landscape	Treated by Existing Facility
DMA 5	29,331	Landscape	Self-Treating

IV.A.2. Drainage Management Area Descriptions

DMA 1, totaling 370,172 square feet, drains the concrete/asphalt, roof, and landscape areas of the site to the bioretention area located on the northern side of the site. DMA 1 includes an on-site portion of the existing Wildflower Station Place concrete/asphalt area as well as approximately 18,440 square feet of off-site concrete/asphalt, roof, and landscaped area.

DMA 2, totaling 27,974 square feet, drains the concrete/asphalt, roof, and landscape areas of the site to the bioretention area located on the southern side of the site.

DMA 3, totaling 32,222 square feet, drains the existing concrete/asphalt and landscape areas of Wildflower Station Place to existing bioretention facilities to remain.

DMA 4, totaling 10,538 square feet, drains the existing concrete/asphalt and landscape areas of Hillcrest Crossroads to an existing bioretention facility to remain.

DMA 5, totaling 29,331 square feet, is a landscaped self-treating area.

IV.B. Integrated Management Practice Descriptions

This portion of the Wildflower Station project consists of 2 integrated management practices (IMPs) that provide treatment for on-site stormwater runoff. IMP 1 is located on the north side of the site. A portion of the previously constructed Wildflower Station Place pavement, concrete walks, roof, and landscaped areas will be conveyed and managed by IMP 1. IMP 2 is located on the south side of the site. Each IMP will treat and detain runoff from multiple surface types that include concrete or asphalt, roof, and landscaping.

The project utilized the low impact development design guide in the Stormwater C.3 Guidebook to meet both treatment and flow-control requirements and comply with the Municipal Regional Stormwater Permit (MRP) and the Contra Costa Clean Water Program. For detailed locations of different DMA and IMP areas, please refer to Figure 5. Refer to Attachment 1 for the IMP sizing calculations. Other IMP options are not sustainable for this project.

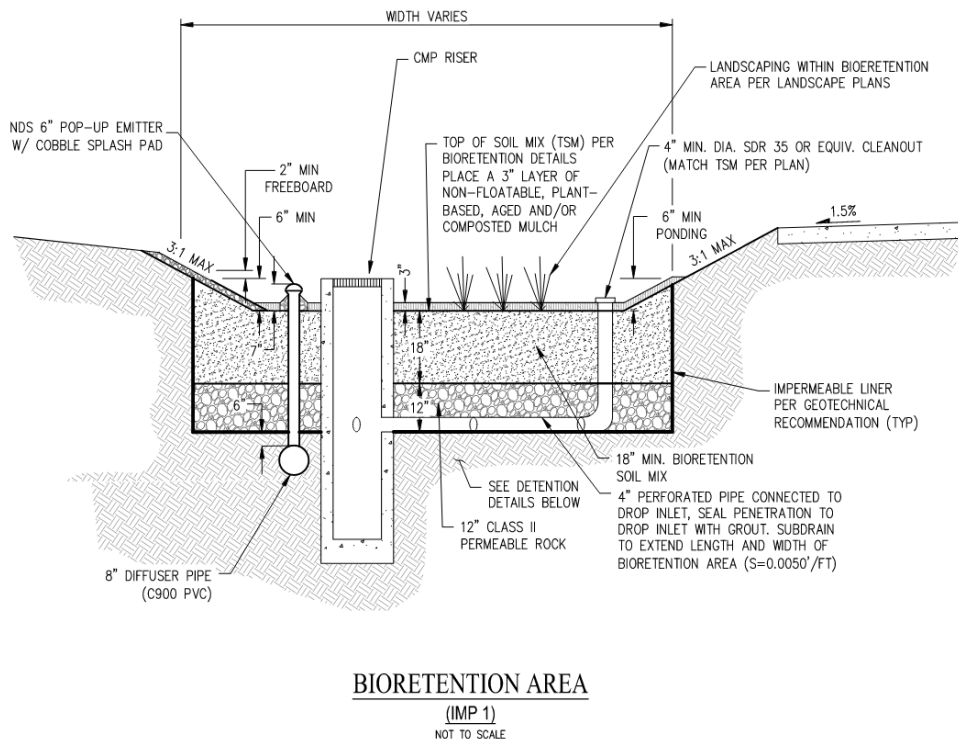


Figure 1: Bioretention Cross-Section for IMP 1 (Schematic)

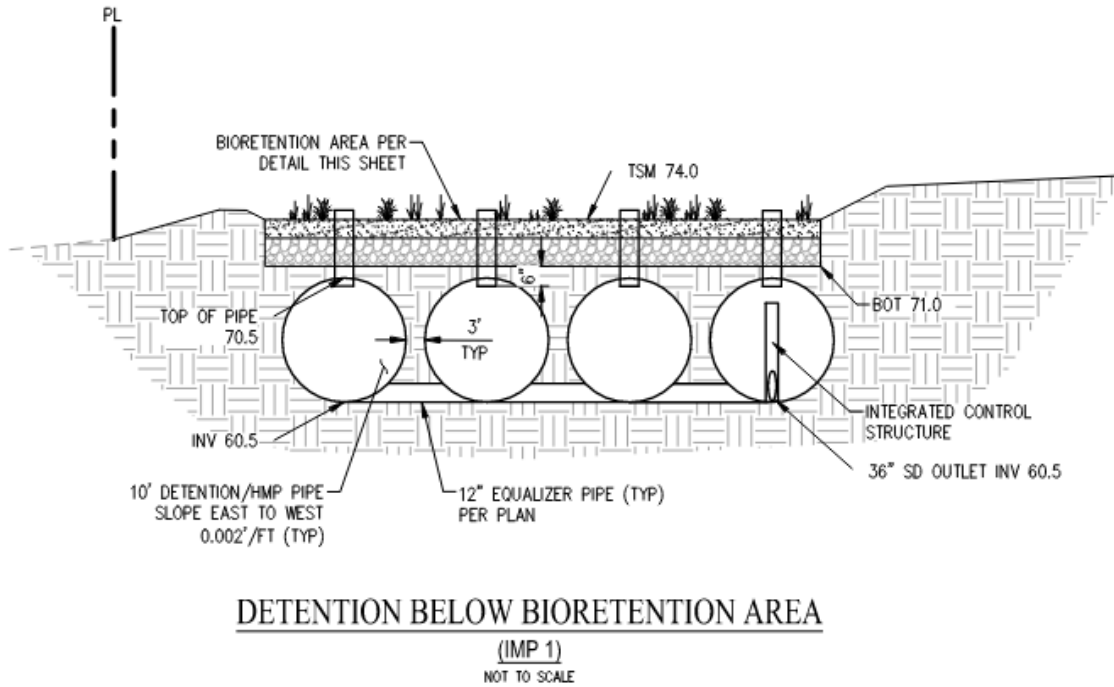


Figure 2: Detention Below IMP 1 Bioretention Area Cross-Section (Schematic)

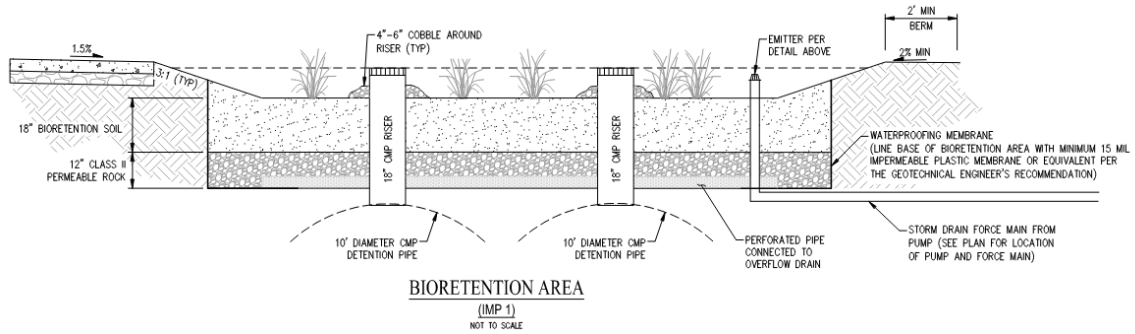


Figure 3: Detention Below IMP 1 Bioretention Area Cross-Section Detail (Schematic)

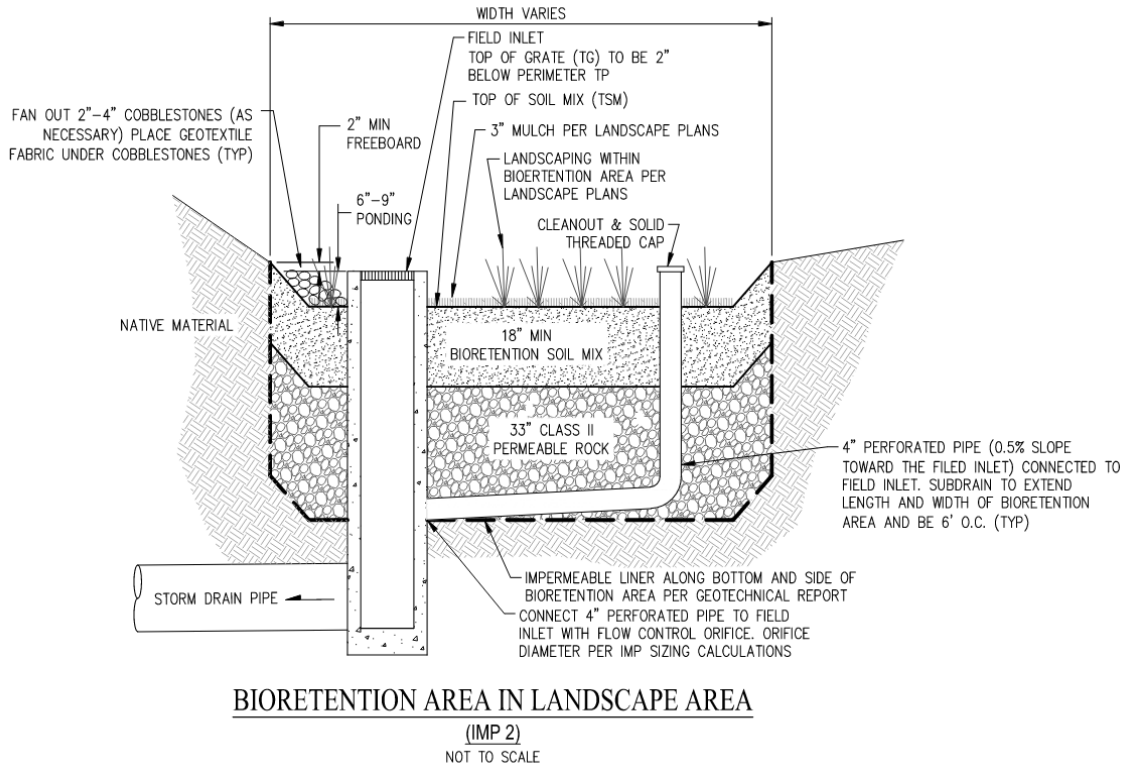


Figure 4: Bioretention Cross-Section for IMP 2 (Schematic)

IV.C. Tabulation and Sizing Calculations

See Attachment 1, IMP Sizing Calculator Output.

V. SOURCE CONTROL MEASURES

V.A. Site activities and potential sources of pollutants

Potential sources of stormwater pollutants for the Project include:

- The dumping of pollutants into the storm drain system
- Pesticides for indoor pest control
- Pesticides, herbicides, and fertilizer for landscape maintenance
- Nutrients from the waste of household pets
- Grease, Oil, and heavy metals due to vehicles

V.B. Source Control Table

Table 3. Source Controls

<i>Potential source of runoff pollutants</i>	<i>Permanent source control BMPs</i>	<i>Operational source control BMPs</i>
On-site dumping into storm drain system	All storm drain inlets will be marked with the words “No Dumping in the Drains!”	Residents will be provided with pollution prevention information. These markings will be repainted/replaced when needed. Storm drain inlets and pipes that connect to IMPs will be maintained per the Projects Operations and Maintenance Plan.
Indoor Pest Control		Residents will be provided with Integrated Pest Management information.
Landscape	The landscape will minimize the use of fertilizers, herbicides, and pesticides. It will decrease runoff and promote infiltration. The landscape will use plants that are suitable for the site’s soil and weather conditions, as well as, choosing pest-resistant plants along hardscape where possible.	
Roofing, Gutters & Trim	The buildings roofing, gutters, and trimmings will not use copper or other unprotected metals to prevent leach into the stormwater.	
Fire Sprinkler Test	A means to drain water from a fire sprinkler test will be provided to the sanitary sewer system.	

V.C. Features, Materials, and Methods of Construction of Source Control BMPs

When constructing the drainage inlets, the contractor will attach the “no dumping” inlet marker to each inlet. The design of the low flow pump vault will include a sediment sump which will be implemented during construction for a source control BMP.

VI. STORMWATER FACILITY MAINTENANCE

VI.A. Ownership and Responsibility for Maintenance in Perpetuity

All stormwater management facilities in this stormwater control plan will be the responsibility of the owners (Meadow Creek Group, Inc.) to manage and maintain. Upon completion, the management of stormwater facilities will transfer to the future homeowners’ association (HOA). It will be the duty of Meadow Creek Group, Inc. to provide a comprehensive Stormwater Control Operations and Maintenance Plan (O&M Plan) to the HOA.

VI.B. Summary of Maintenance Requirements for Each Stormwater Facility

As stated, the O&M Plan will provide a full listing of operations and maintenance requirements. This will include monitoring and maintenance associated with the IMPs. For proper maintenance of the bioretention facilities, the management will have regular inspections of physical features including inlet and outlet structures. They will monitor water drawdown rates, verifying proper infiltration through the bioretention’s soil. When necessary, the bioretention mulch will need to be leveled or replaced, the medium will need to be reconditioned or replacement and the underdrains will need clearing of debris. A regular inspection of the vegetation may necessitate pruning, replanting, or control over undesired invasive species.

VII. CONSTRUCTION PLAN C.3 CHECKLIST

The construction plan checklist will be completed when approved project improvement plans are available.

Table 4. Construction Plan C.3 Checklist

*Stormwater
Control
Plan
Page #*

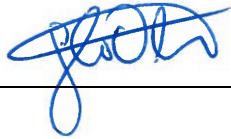
BMP Description

See Plan Sheet #s

12	IMP 1 Bioretention	
12	IMP 2 Bioretention	

VIII. CERTIFICATIONS

The selection, sizing, and preliminary design of stormwater treatment and other control measures within this plan meet the requirements of Regional Water Quality Control Board Order R2-2015-0049.



By

Angelo Obertello

Print Name

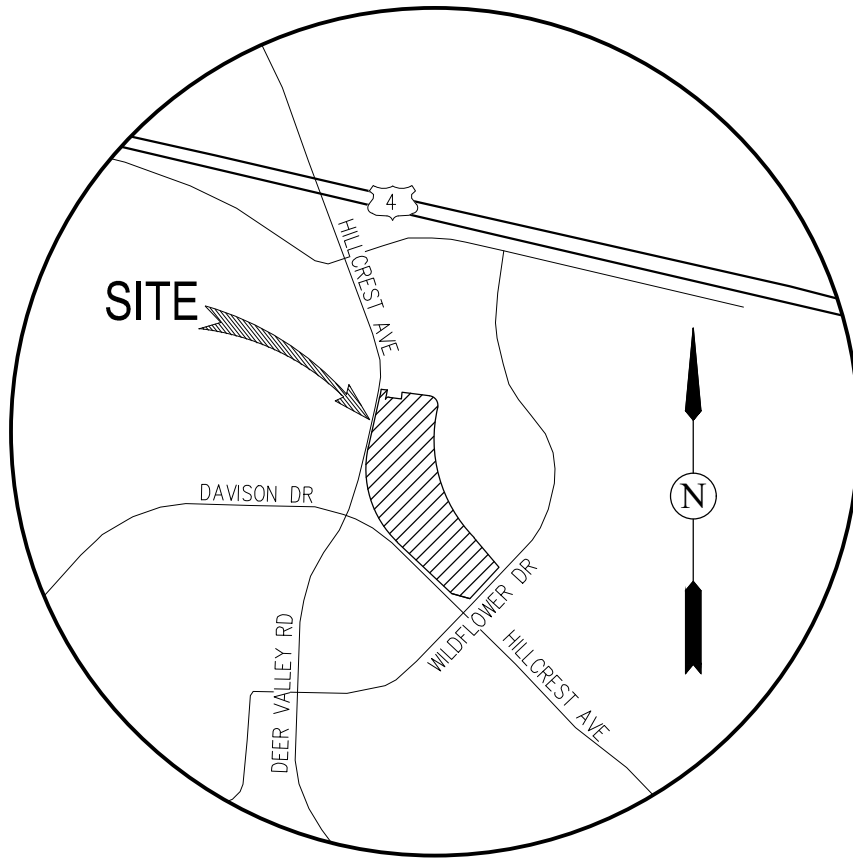


EXHIBIT 1

VICINITY MAP

CITY OF ANTIOCH CONTRA COSTA COUNTY CALIFORNIA

DATE: FEBRUARY 2, 2024 NOT TO SCALE








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LEGEND

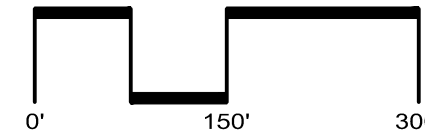
-  PROJECT BOUNDARY
- EXISTING STORM DRAIN PIPE
-  IMPERVIOUS ASPHALT OR CONCRETE
-  ROOF
-  CONSTRUCTED AREA TO BE TREATED BY PROPOSED PROJECT (57,570 SF±)
-  CONSTRUCTED AREAS TREATED BY EXISTING FACILITIES – SUBDIVISION 9427 (42,760 SF±)

EXISTING SURFACE COVER	
DESCRIPTION	AREA (SF) ±
LANDSCAPE	337,860
IMPERVIOUS ASPHALT/CONCRETE	112,740
ROOF	13,670
TOTAL	464,270

EXHIBIT 2 EXISTING CONDITIONS

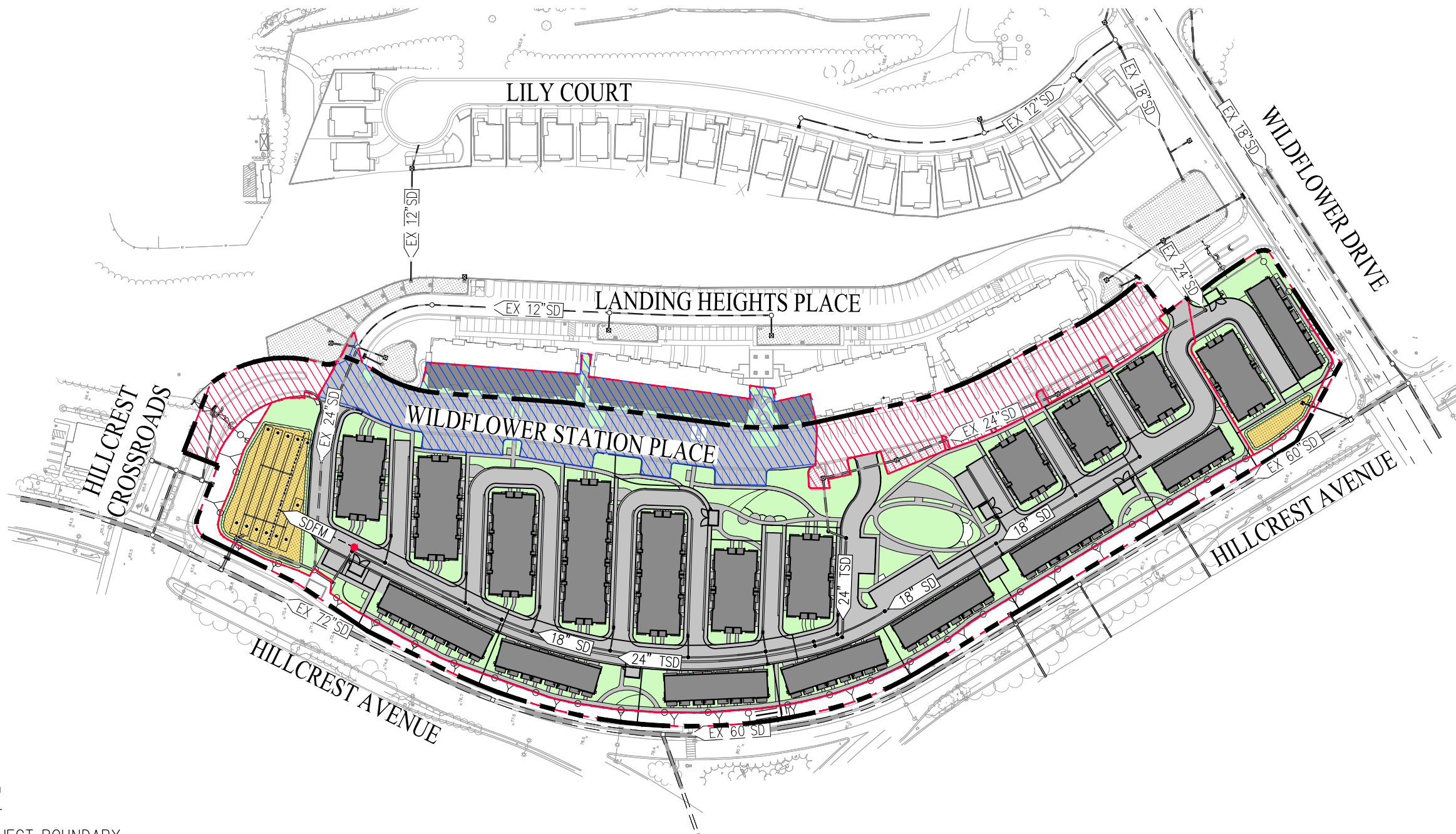
CITY OF ANTIOCH CONTRA COSTA COUNTY CALIFORNIA

SCALE: 1"=150' DATE: FEBRUARY 2, 2024



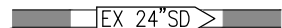
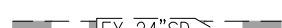





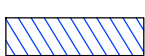



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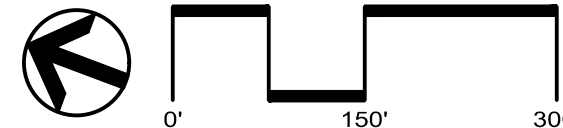


LEGEND

-  PROJECT BOUNDARY
-  DMA BOUNDARY
-  PROPOSED STORM DRAIN PIPE
-  EXISTING STORM DRAIN PIPE
-  LOW-FLOW STORMWATER PUMP MANHOLE
-  IMPERVIOUS ASPHALT OR CONCRETE
-  LANDSCAPE
-  ROOF
-  BIORETENTION AREA
-  CONSTRUCTED AREA TO BE TREATED BY PROPOSED PROJECT (57,570 SF±)
-  CONSTRUCTED AREAS TREATED BY EXISTING FACILITIES – SUBDIVISION 9427 (42,760 SF±)

TREATED SURFACE COVER	
DESCRIPTION	AREA (SF) ±
LANDSCAPE	83,401
IMPERVIOUS ROOF	123,860
IMPERVIOUS ASPHALT/CONCRETE	176,368
BIORETENTION AREA	14,517
TOTAL	398,146

EXHIBIT 3
PROPOSED CONDITIONS
 CITY OF ANTIOCH CONTRA COSTA COUNTY CALIFORNIA
 SCALE: 1"=150' DATE: FEBRUARY 2, 2024



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Project Name: Wildflower Townhomes
Project Type: Treatment and Flow Control
APN: 052-0140-013 Thru 16
Drainage Area: 398,146
Mean Annual Precipitation: 13.6

IV. Areas Draining to IMPs

IMP Name: IMP1

IMP Type: Bioretention + Vault

Soil Group: IMP1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing			
					IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA 1A	112,910	Conventional Roof	1.00	112,910				
DMA 1B	168,268	Concrete or Asphalt	1.00	168,268				
DMA 1C	76,168	Landscape	0.50	38,084				
Total				319,262				
				Area Volume	0.040	1.000	12,770	12,826
					0.152	1.242	60,272	60,868
							Maximum Underdrain Flow (cfs)	0.29
							Orifice Diameter (in)	2.48

IMP Name: IMP2

IMP Type: Bioretention Facility

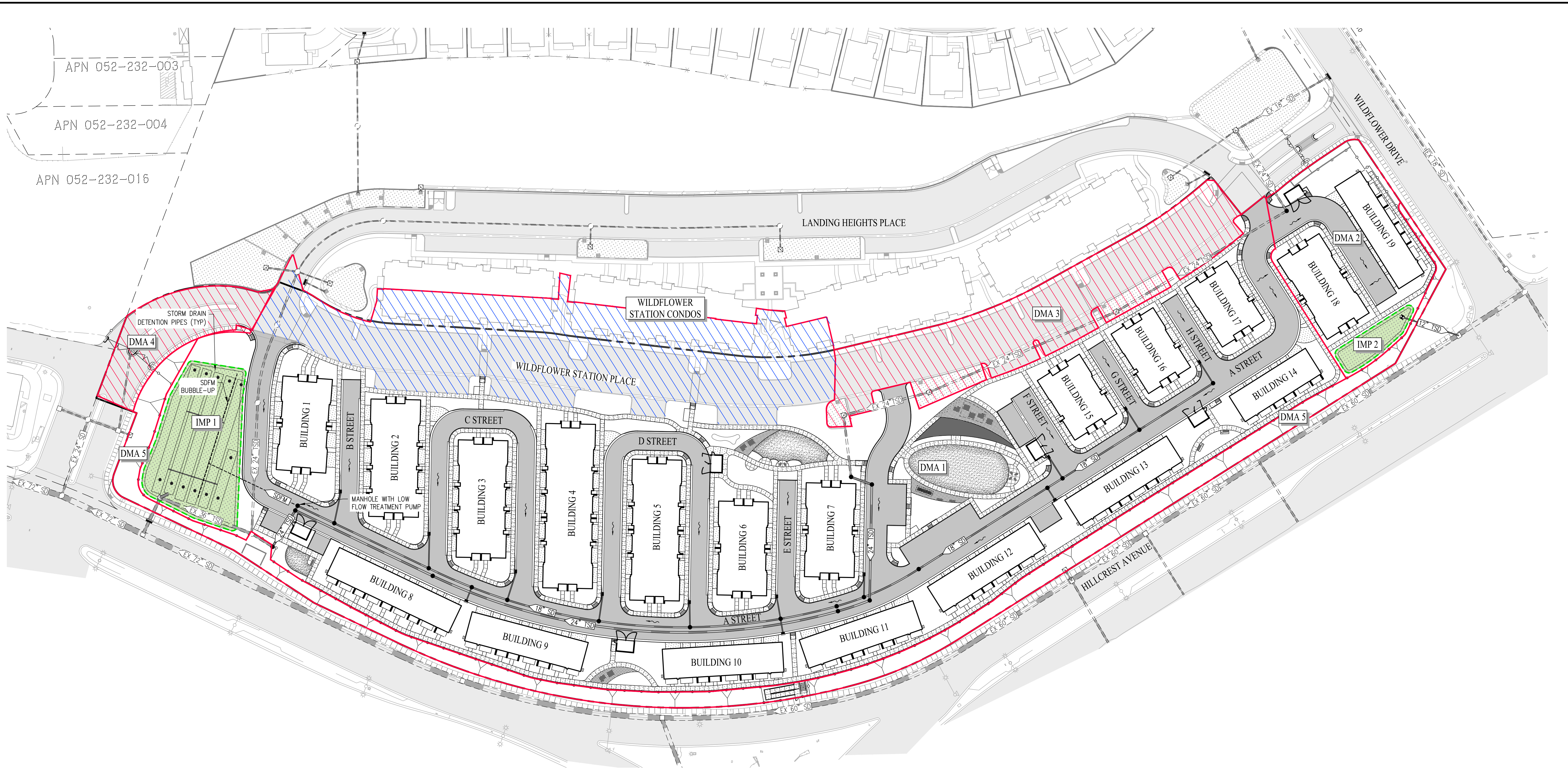
Soil Group: IMP2

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing			
					IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA 2A	10,950	Conventional Roof	1.00	10,950				
DMA 2B	8,100	Concrete or Asphalt	1.00	8,100				
DMA 2C	7,233	Landscape	0.50	3,617				
Total				22,667				
				Area Surface Volume	0.060	1.242	1,689	1,691
				Subsurface Volume	0.050	1.242	1,408	1,410
					0.066	1.242	1,858	1,861
							Maximum Underdrain	0.02

Flow (cfs)
Orifice
Diameter (in)



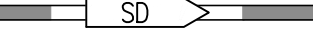
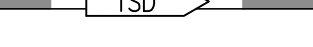
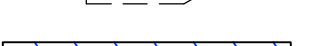


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 APN 052-232-004
 APN 052-232-016

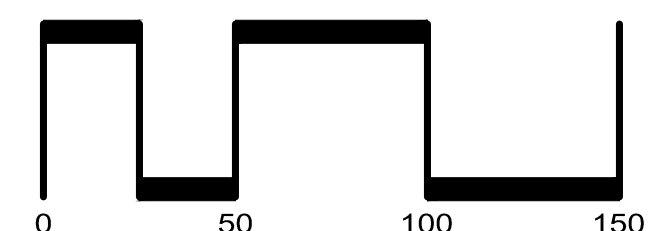
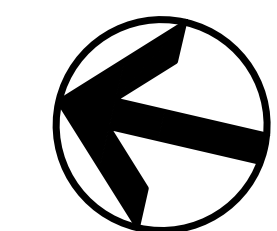
LEGEND

	DMA BOUNDARY
	PROPOSED BIORETENTION
	PROPOSED STORM DRAIN LINE
	PROPOSED TREATED STORM DRAIN LINE
	EXISTING STORM DRAIN LINE
	CONSTRUCTED AREA TO BE TREATED BY PROPOSED PROJECT
	CONSTRUCTED AREAS TREATED BY EXISTING FACILITIES - SUBDIVISION 9427

PRELIMINARY STORMWATER CONTROL PLAN

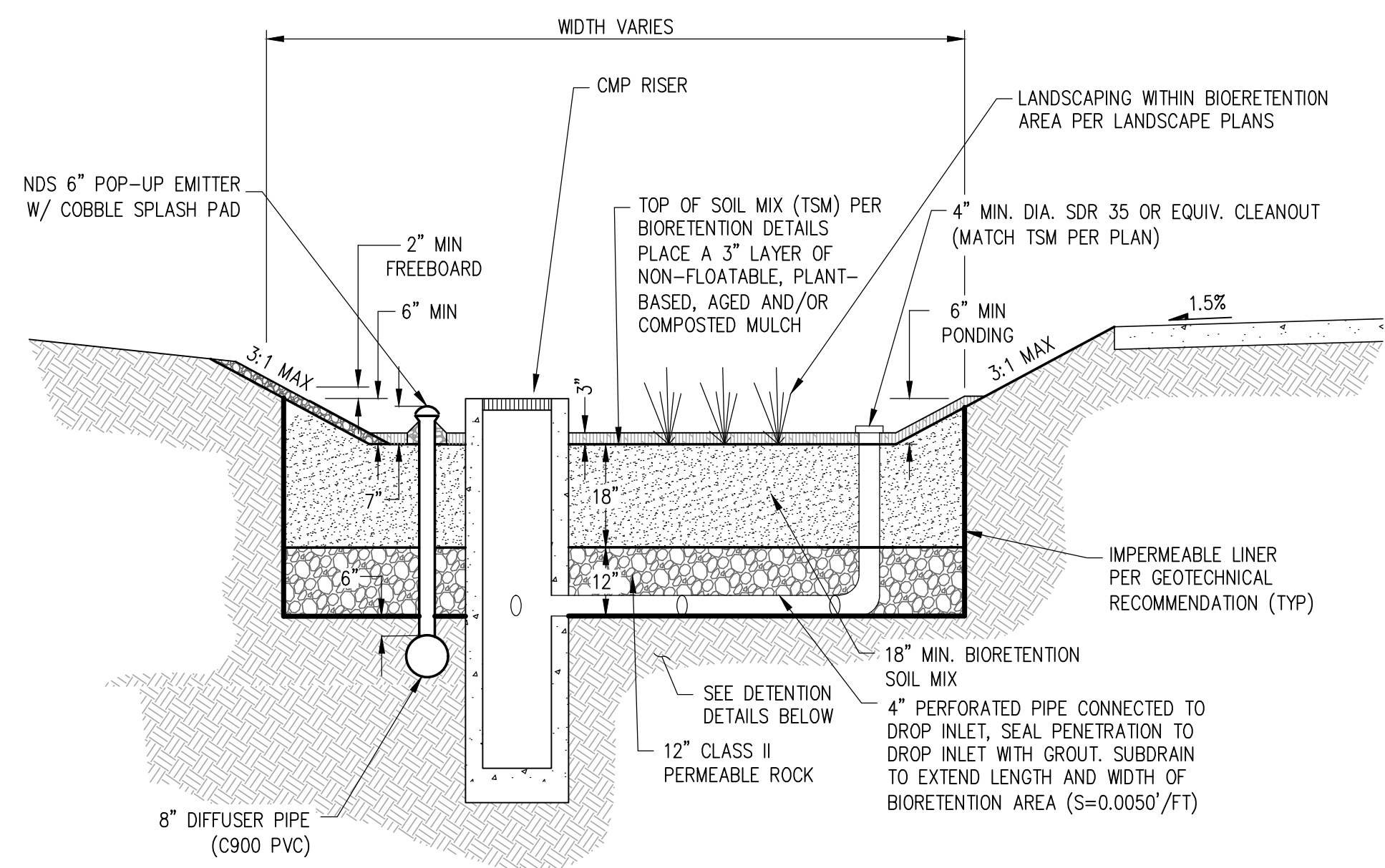
WILDFLOWER STATION - SUBDIVISION 9601

CITY OF ANTIOCH CONTRA COSTA COUNTY CALIFORNIA
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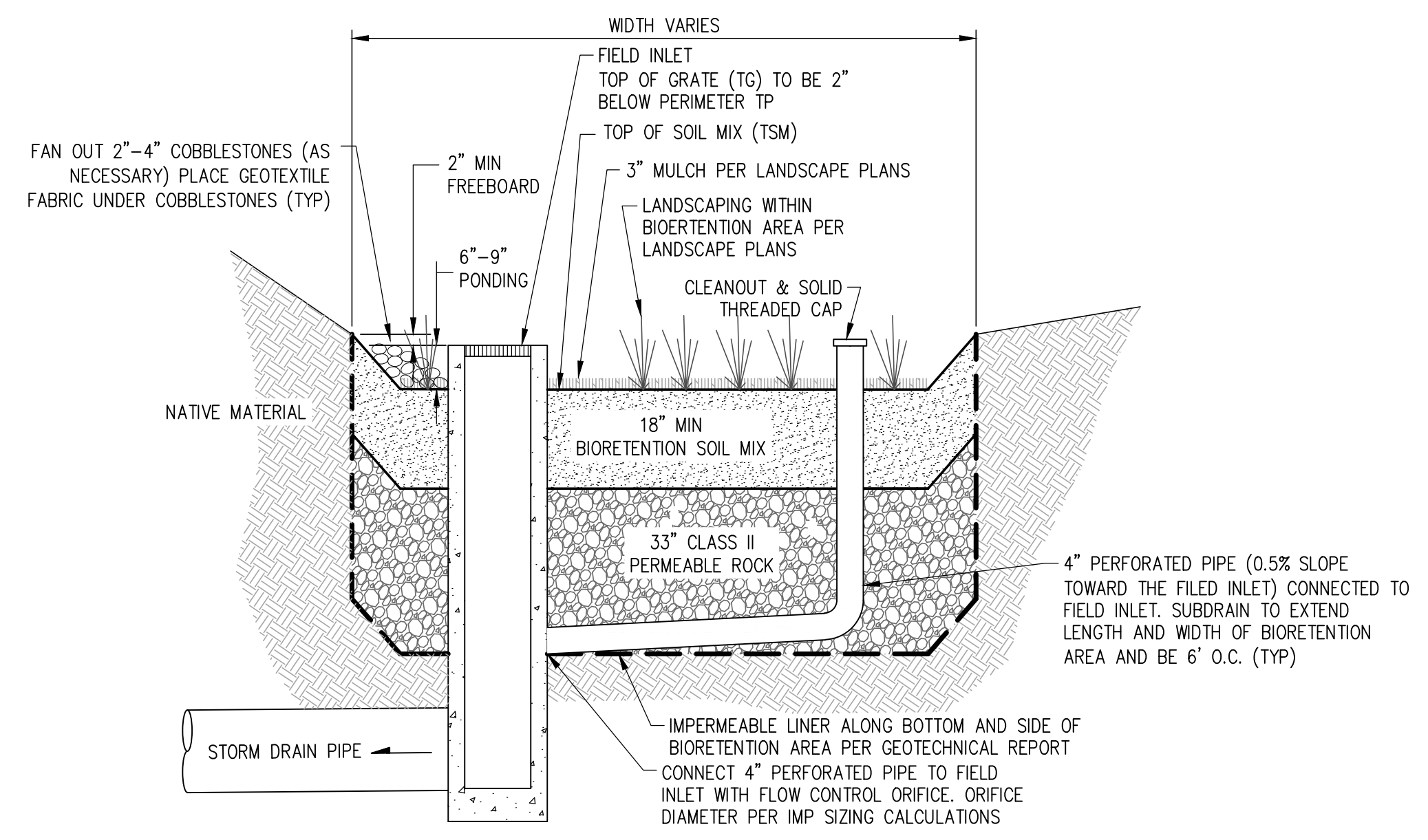


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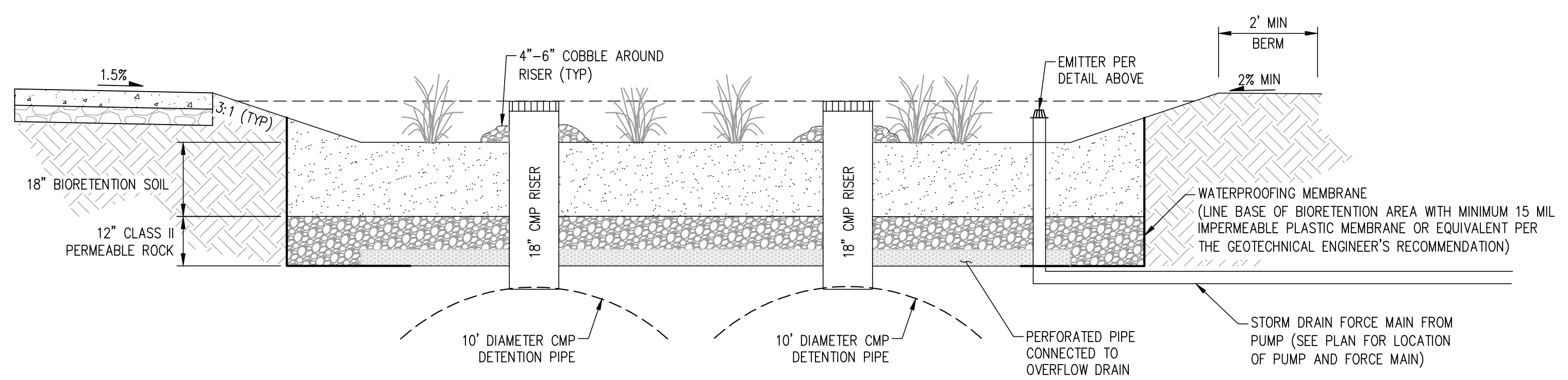
SHEET NO.
11
 OF 17 SHEETS



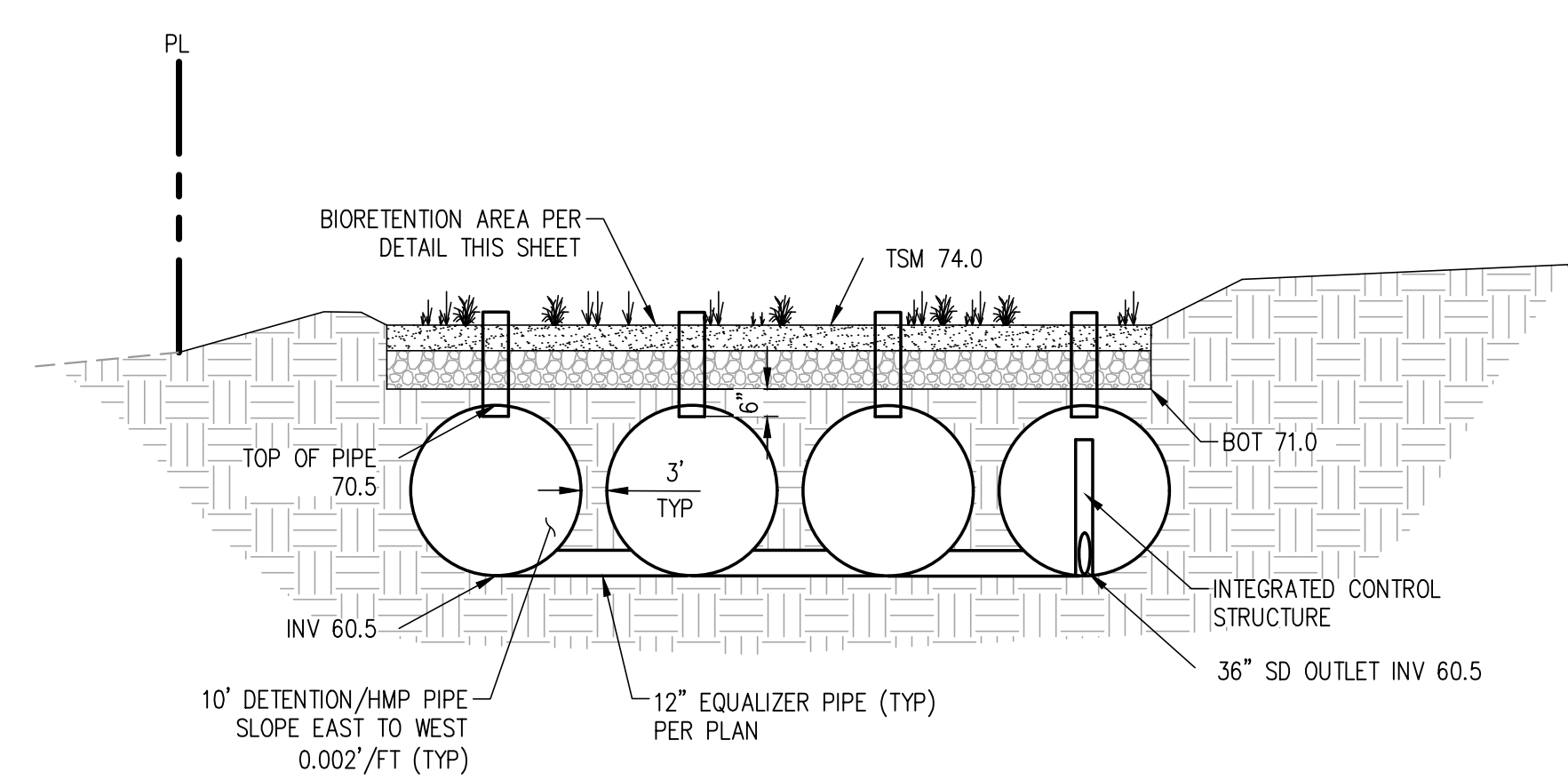
BIORETENTION AREA
(IMP 1)
NOT TO SCALE



BIORETENTION AREA IN LANDSCAPE AREA
(IMP 2)
NOT TO SCALE



BIORETENTION AREA
(IMP 1)
NOT TO SCALE



DETENTION BELOW BIORETENTION AREA
(IMP 1)
NOT TO SCALE

Project Name: Wildflower Townhomes
Project Type: Treatment and Flow Control
APN: 052-0140-013 Thru 16
Drainage Area: 398,146
Mean Annual Precipitation: 13.6

IV. Areas Draining to IMPs

IMP Name: IMP1
IMP Type: Bioretention + Vault
Soil Group: IMP1

DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA 1A	112,910	Conventional Roof	1.00	112,910	0.040	1.000	12,770	12,826
DMA 1B	168,268	Concrete or Asphalt	1.00	168,268				
DMA 1C	76,168	Landscape	0.50	38,084				
Total				319,262	0.152	1.242	60,272	60,868
				Area Volume				0.29
							Maximum Underdrain Flow (cfs) Orifice Diameter (in)	2.48

IMP Name: IMP2
IMP Type: Bioretention Facility
Soil Group: IMP2

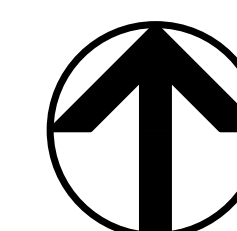
DMA Name	Area (sq ft)	Post Project Surface Type	DMA Runoff Factor	DMA Area x Runoff Factor	IMP Sizing Factor	Rain Adjustment Factor	Minimum Area or Volume	Proposed Area or Volume
DMA 2A	10,950	Conventional Roof	1.00	10,950	0.060	1.242	1,689	1,691
DMA 2B	8,100	Concrete or Asphalt	1.00	8,100				
DMA 2C	7,233	Landscape	0.50	3,617				
Total				22,667	0.050	1.242	1,408	1,410
				Area Surface Volume				1,858
				Subsurface Volume	0.066	1.242	1,858	1,861
							Maximum Underdrain	0.02

IMP CALCULATOR OUTPUT
NOT TO SCALE

STORMWATER DETAILS

WILDFLOWER STATION - SUBDIVISION 9601

CITY OF ANTIOCH CONTRA COSTA COUNTY CALIFORNIA
SCALE: NTS DATE: FEBRUARY 2, 2024



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SHEET NO.
12
OF 17 SHEETS